

Empire Wind 2 Project

Article VII Application Summary Memorandum

Appendix K

Phase I Terrestrial Archaeological Survey

Nassau County, New York

Prepared for
Empire Offshore Wind LLC



Prepared by
Tetra Tech, Inc.



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June 2022

MANAGEMENT SUMMARY

NY SHPO Project Review Number:	18PR07274
Involved State and Federal Agencies:	NY SHPO (Section 14.09 of the New York State Parks, Recreation and Historic Preservation Law) Bureau of Ocean Energy Management (Section 106 of the National Historic Preservation Act)
Phase of Survey:	Phase IA/IB Terrestrial Archaeological Survey
Location Information:	Town of Hempstead and City of Long Beach, Nassau County, New York
Survey Area:	
Project Description:	Offshore Wind Energy Project with associated Onshore Infrastructure
Onshore NY Project Area:	Cable Landfall of up to 4.9 acres; Onshore Export and Interconnection Cable Corridors of up to 5.7 miles; Onshore Substation of 5.2 acres
U.S. Geological Survey 7.5-Minute Quadrangle Map:	Hempstead, NY
Archaeological Resources Overview:	No terrestrial archaeological resources have been previously recorded within 1 mile (1.6 kilometers) of the NY Project
Report Author:	Robert M. Jacoby, M.A., RPA
Date of Report:	June 2022

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ACRONYMS AND ABBREVIATIONS

ac	acre
AD	anno Domini
APE	Area of Potential Effects
BC	before Christ
BOEM	Bureau of Ocean Energy Management
BP	years before present
CFR	Code of Federal Regulations
COP	Construction and Operations Plan
CRIS	Cultural Resource Information System
Empire, the Applicant	Empire Offshore Wind LLC
EW 2	Empire Wind 2
ft	feet
ha	hectare
HDD	horizontal directional drilling
HVAC	high-voltage alternating current
km	kilometer
kV	kilovolt
Lease Area	Designated Renewable Energy Lease Area OCS-A 0512
LIPA	Long Island Power Authority
LIRR	Long Island Rail Road
m	meter
mi	mile
nm	nautical mile
NRHP	National Register of Historic Places
NYSPSC or Commission	New York State Public Service Commission
NY SHPO	New York State Office of Parks, Recreation and Historic Preservation
PAPE	Preliminary Area of Potential Effects
POI	Point of interconnection at an expansion of the Barrett 138-kV Substation
PSEG-LI	PSEG Long Island
NY Project	EW 2 Project transmission facilities in New York
NY Project Area	The submarine export cable corridor, onshore export and interconnection cable corridors and onshore substation facilities within New York State jurisdiction
Tetra Tech	Tetra Tech, Inc.

K.1 Introduction

Tetra Tech, Inc. (Tetra Tech) was contracted by Empire Offshore Wind LLC¹ (Empire, the Applicant) to prepare this Terrestrial Archaeological Survey Report in support of the development of the Empire Wind 2 (EW 2) Project. Empire proposes to construct and operate the EW 2 Project (**Figure K-1**) as one of two separate offshore wind projects to be located within the Bureau of Ocean Energy Management (BOEM) designated Renewable Energy Lease Area OCS-A 0512 (Lease Area). This assessment is being submitted as part of the review by the New York State Public Service Commission (NYSPSC or Commission) for the portions of the EW 2 Project transmission system located within the State of New York (collectively the NY Project) pursuant to Article VII of the New York Public Service Law (PSL). This memorandum provides an abbreviated summary of the Terrestrial Archaeological Survey Report for the onshore NY Project.

The NY Project will interconnect to the New York State Transmission System operated by the New York Independent System Operator, Inc. at the Oceanside Point of Interconnection (POI) at an expansion of the Barrett 138-kilovolt (kV) Substation. The Barrett 138-kV Substation is owned by the Long Island Power Authority (LIPA) and operated by PSEG Long Island (PSEG-LI) and is located in Oceanside in the Town of Hempstead, New York. The onshore NY Project will be located entirely within Nassau County, New York.

A Construction and Operations Plan (COP) was submitted to BOEM in January 2020, with subsequent revisions in response to agency comments, as required by 30 Code of Federal Regulations (CFR) Part 585. BOEM's approval of the COP, allowing for construction and operation of the EW 2 Project, is contingent, in part, on the completion of archaeological investigations to identify potentially significant archaeological resources that may be subject to disturbances due to EW 2 Project activities within the Area of Potential Effects (APE) (30 CFR § 585.626(a)(5)). This memorandum discusses the Phase I terrestrial archaeological survey of the NY Project Area, which consists of the cable landfall, onshore export and interconnection cable routes, and onshore substation (onshore NY Project Area) located in Nassau County, New York (**Figure K-2**). Where appropriate, this memorandum also discusses the Phase I terrestrial archaeological survey of reasonable alternatives to the NY Project.

K.1.1 Project Description

The NY Project includes:

- Three three-core 230-kV high-voltage alternating-current (HVAC) submarine export cables located within an approximately 7.7-nautical miles (nm, 14.2-km)-long submarine export cable corridor from the boundary of New York State waters 3 nm (5.6 km) offshore to the cable landfall;
- A cable landfall in the City of Long Beach, New York;
- Three 230-kV onshore export cable circuits, each with three single-core HVAC onshore export cables within an approximately 1.5-mi (2.4-km)-long onshore export cable corridor from the cable landfall to the onshore substation;

¹ Empire is a direct, wholly owned subsidiary of Empire Offshore Wind Holdings LLC (Empire HoldCo). Empire HoldCo is jointly owned by (1) an indirect, wholly owned subsidiary of Equinor ASA (collectively, Equinor); and (2) an indirect, wholly owned subsidiary of BP Wind Energy North America Inc.. BP Wind Energy North America Inc. acquired ownership interest in Empire HoldCo in a transaction that closed on January 29, 2021.

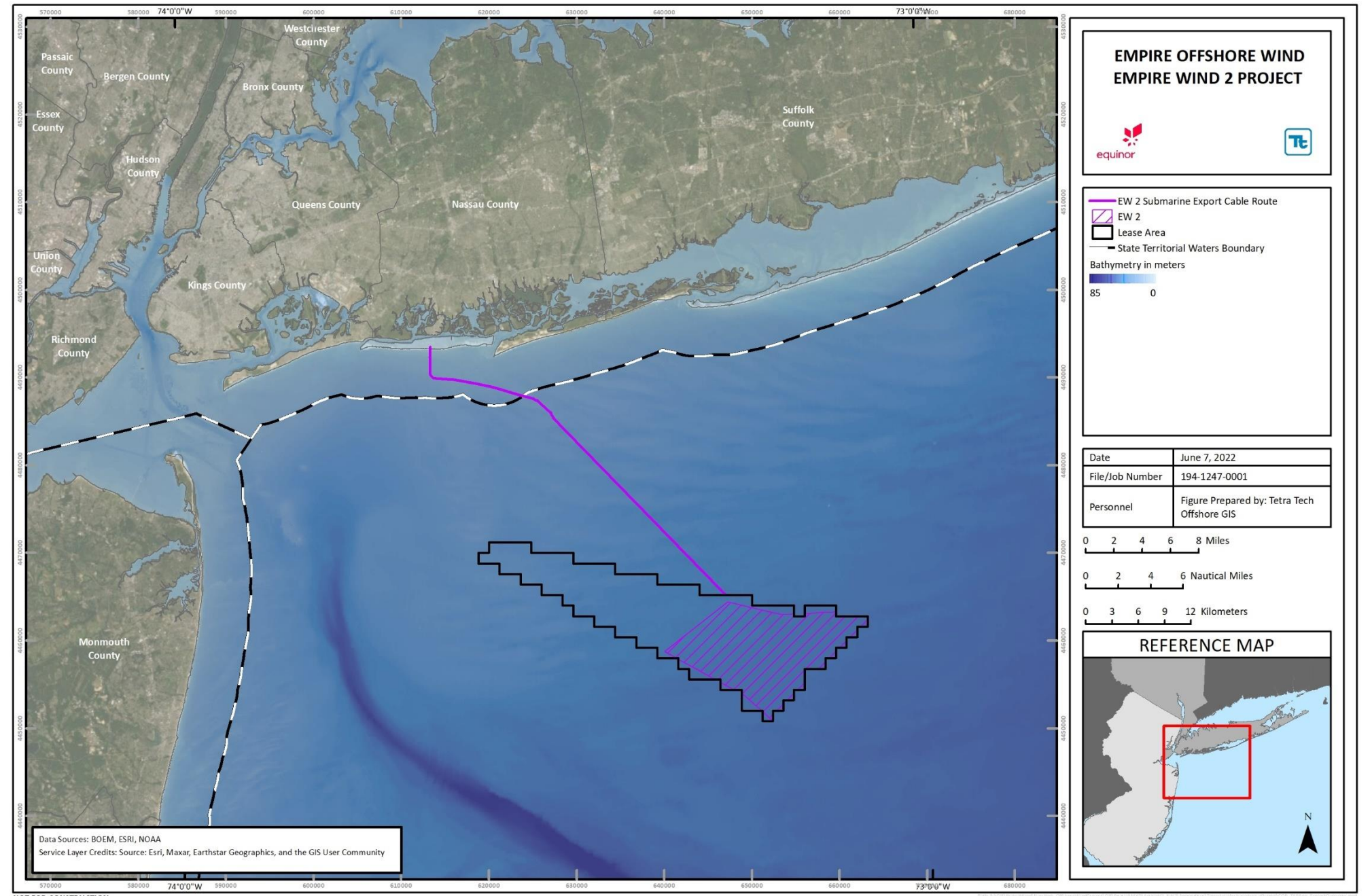


Figure K-1 EW 2 Project Overview

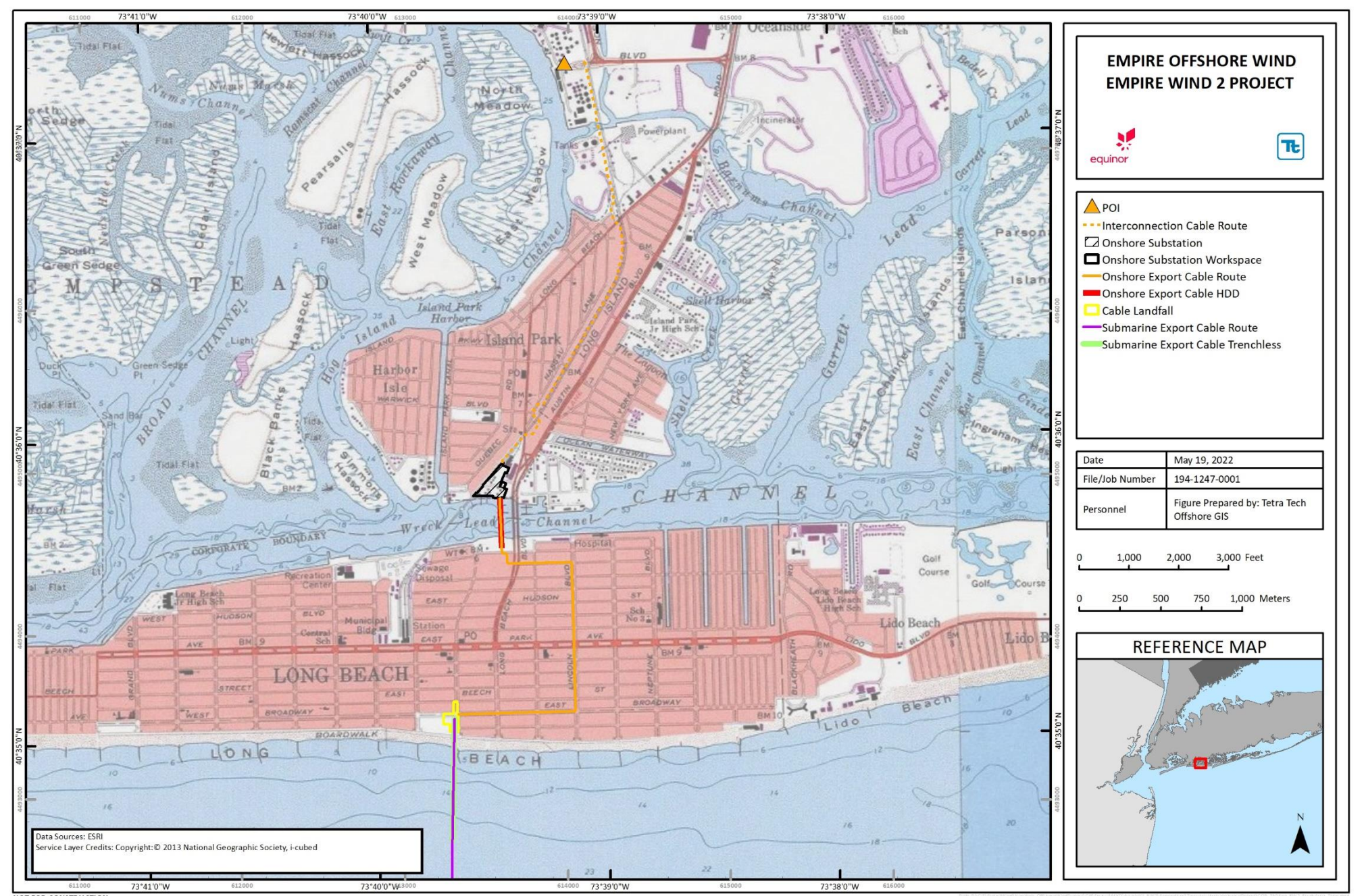


Figure K-2 Onshore NY Project Area Overview and Study Area, Topographic Background

- An onshore substation in the Village of Island Park, within the Town of Hempstead, New York, which will increase the voltage to 345 kV for the onshore interconnection cables; and up to three 345-kV interconnection cable circuits, each with three single-core HVAC interconnection cables within an approximately 1.7-mi (2.8-km)-long interconnection cable corridor from the onshore substation to the POI.

The NY Project proposes to interconnect in Oceanside, New York, where the renewable electricity generated will be transmitted to the electric grid. The transition from submarine export cables to the onshore export cables will occur at the cable landfall in the City of Long Beach, Long Island. One onshore substation location is proposed in the Article VII Application at 15 Railroad Place in Island Park, New York. The location of the onshore facilities is shown in **Figure K-2**.

Construction of the onshore substation will be predominantly located within the 5.2-ac (2.1-ha) onshore substation site. However, an additional temporary work area adjacent to the onshore substation will be required during installation of the onshore export cables underneath Reynolds Channel via horizontal directional drill (HDD), which terminate within the onshore substation site. The total construction work area for the onshore substation, including the space required for the HDD, will be 5.4 ac (2.2 ha). This temporary construction work area outside of the perimeter fence line of the onshore substation will be restored to pre-construction conditions, to the extent practicable, following construction activities.

K.1.2 Regulatory Authority

Several federal, state, and local agencies have regulatory authority over the NY Project based on the location of the different components. Onshore facilities, including the onshore substation, will be located in the Town of Hempstead, City of Long Beach, and Village of Island Park.

The NY Project is subject to regulation by BOEM under provisions of the Outer Continental Shelf Renewable Energy Program authorized by the Energy Policy Act of 2005 (42 United States Code §§ 13201 *et seq.*). In 2016, BOEM executed a Programmatic Agreement with the State Historic Preservation Offices (SHPOs) of New Jersey and New York, the Shinnecock Indian Nation, and the Advisory Council on Historic Preservation to formalize agency jurisdiction and coordination for the review of offshore renewable energy development regarding cultural resources (BOEM 2017). The Programmatic Agreement recognized that issuing renewable energy leases on the Outer Continental Shelf constituted an undertaking subject to Section 106 of the National Historic Preservation Act. BOEM, as the lead federal agency in this process, has authority to initiate consultations with the SHPOs, and to consult with interested Native American Tribes.

An electric transmission line with a design capacity of 125 kV or more, extending a distance of one mile or more, is also subject to review and approval by the NYSPSC as a major electric transmission facility pursuant to Article VII of the PSL. The EW 2 Project is subject to review by the Commission for the portions of the EW 2 Project transmission system located within the State of New York. Per 16 New York Code of Rules and Regulations § 86.5, Article VII applications must consider avoidance of “scenic, recreational and historic areas.” The New York State Historic Preservation Act of 1980, the state counterpart to the National Historic Preservation Act, establishes the New York State Register of Historic Places.

K.1.3 State Historic Preservation Office Coordination

Empire and its consultants coordinated with the New York State Office of Parks, Recreation and Historic Preservation in its role as New York State Historic Preservation Office (NY SHPO) prior to initiation of cultural resource surveys. Tetra Tech provided NY SHPO with a work plan, dated December 13, 2018, that included a project description, a direct effects APE defined as “all areas where ground-disturbing activity will

take place including export cable corridors and all associated appurtenances such as landfalls, horizontal direct drill entry and exit locations, workspaces, equipment laydown areas, and access roads,” and methodological approaches to conducting cultural resource surveys of terrestrial archaeology (including a 1-mi [1.6-km] Study Area buffer around the onshore cable route, see Section K.2.2.1 Study Area), marine archaeology, and historic architecture. In a letter dated December 19, 2018, NY SHPO approved Tetra Tech’s work plan and noted that the agency would accept a reduction to 0.25 mi (0.4 km) on each side of the proposed onshore export and interconnection cable routes, for a 0.5-mi (0.8-km) buffer total. After this approval, Empire revised its export cable routing; thus, Tetra Tech provided NY SHPO with a revised work plan and NY Project description, dated August 22, 2019. NY SHPO, in a response dated August 30, 2019, accepted this work plan and expressed no further comments or questions. Empire provided a NY Project-update letter to the NY SHPO in April 2021, introducing the additional EW 2 onshore export and interconnection cable routes and onshore substation site. NY SHPO confirmed receipt of the update and had no comments at the time. In August 2021 and October 2021, Empire provided NY SHPO NY Project-update letters presenting proposed locations of geotechnical borings. Tetra Tech recommended that no further archaeological investigation was warranted due to a lack of archaeological sensitivity at the locations, and on August 17, 2021 and October 29, 2021 NY SHPO concurred without further comment. Empire also provided NY SHPO a NY Project-update letter introducing an additional cable landfall alternative (Cable Landfall Alternative E) and additional onshore export and interconnection cable routes on May 9, 2022. Tetra Tech recommended that no further archaeological investigation was warranted due to a lack of archaeological sensitivity at the locations; NY SHPO review is pending at the time of this submittal.

K.2 Research Design

This section describes the objectives and methods of the Phase I survey.

K.2.1 Survey Objectives

The purpose of the terrestrial archaeological survey was to satisfy regulatory compliance with NYSPSC’s review under Article VII and BOEM’s Section 106 review of Empire’s COP. The survey objectives were to:

- Investigate the direct and indirect effects preliminary APE (PAPE) (areas that will undergo ground disturbance as a result of the NY Project) and identify archaeological resources that are present therein;
- Evaluate the significance of each identified resource and determine if it may be potentially eligible for listing on the National Register of Historic Places (NRHP);
- Make recommendations to avoid, minimize effects on, or mitigate effects to significant archaeological resources, by the NY Project, if avoidance is not achievable; and
- Register new archaeological sites with NY SHPO and update state site forms for previously documented sites that have been re-located during the survey.

K.2.2 Research Methods

Tetra Tech developed research methods for the Phase I survey that are in accordance with New York Archaeological Council standards for archaeological investigations (NYAC 1994).

K.2.2.1 Study Area

To provide as much flexibility as possible in its early project design, Tetra Tech focused investigations on the cable landfall, onshore cable route (onshore export cable route and interconnection cable route), and the

onshore substation plus a 0.25 mi (0.4 km) radius (0.5 mi [0.8 km] total) buffer around it (the Study Area, **Figure K-2**).

K.2.2.2 Area of Potential Effects (APE)

The APE is “the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist” (36 CFR § 800.16(d)); the APE was also adopted by the NY SHPO in its Phase I Archaeological Report Format Requirements in 2005. Regarding known and potential archaeological resources, this area typically refers to the direct effects APE, which is the area of ground disturbance associated with the NY Project’s construction, operation, maintenance, and decommissioning. Indirect effects to archaeological resources are less common but might include visual or auditory impacts that would adversely affect the character and setting of a significant archaeological site. The APE will be defined by BOEM through the Section 106 process, therefore, this report describes the PAPE, as identified by Tetra Tech.

K.2.2.3 Preliminary Area of Potential Effects (PAPE)

The PAPE for archaeology (**Figure K-3**) consists of areas directly or indirectly affected by ground disturbing activities associated with construction, operations, and maintenance, including but not limited to trench excavating, bore and drill pads, onshore substation construction, laydown yards, and workspaces. The site file review established that there are no NRHP-listed or NRHP-eligible sites within the Study Area, precluding any indirect effects to significant archaeological resources caused by NY Project activities; therefore, indirect effects will not be discussed further in this report. The PAPE includes a 2.4-ac (1.0-ha) cable landfall workspace in the City of Long Beach, the onshore substation, and the onshore export and interconnection cable corridors, as well as any temporary construction staging area and laydown area required for onshore construction of the facilities.

For the 3.2 mi (5.2 km) of onshore export and interconnection cables, a trench will be excavated along the onshore cable route. Typically, the trench will be up to 10 feet (ft, 3 meters [m]) deep and 10-ft (3 m) wide, within an up to 150-ft (46-m)-wide construction corridor, including duct banks for all three circuits. A trenchless crossing via jack and bore installation typically requires an extra work area of approximately 60 ft by 60 ft (18 m by 18 m) alongside the onshore cable corridor. Within the cable corridor, the crossing requires a 60-ft by 60-ft (18-m by 18-m) bore pit to be excavated on one side and a 40-ft by 40-ft (12-m by 12-m) receiving pit on the other side. Workspaces required for trenchless crossings are located at the cable landfall and adjacent to the onshore substation.

K.2.2.4 Background Research

Tetra Tech conducted background research and literature review on topics pertinent to an understanding of the environmental setting and historical development of the Study Area. These topics included bedrock geology, hydrology, soils, Native American land use, Euro-American settlement history, and socio-economic transformations. Tetra Tech reviewed historic maps and aerial imagery to identify documented structures, historic roads, and other landscape features present within the Study Area and the PAPE. The background research is not included in this summary memorandum but is provided in the Empire Offshore Wind: Empire Wind Project (EW 1 and EW 2): Terrestrial Archaeological Resources Assessment, which was filed as Appendix Y of the COP submitted to BOEM.

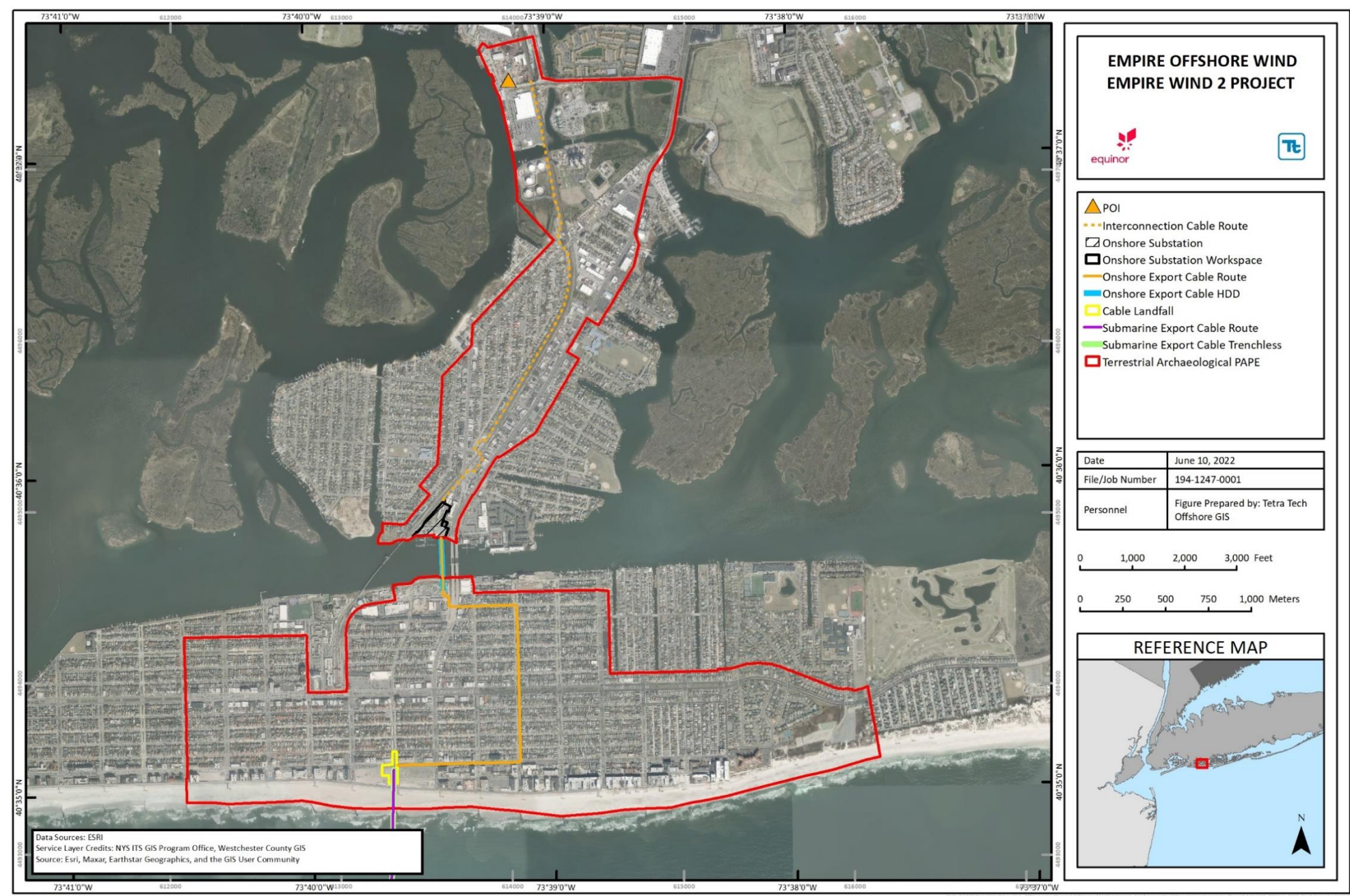


Figure K-3 Onshore NY Project Area Overview and Terrestrial Archaeological PAPE, Aerial Background

K.2.2.5 Site File Review

A research objective to identify local patterns in the archaeological record was achieved via a review of NY SHPO's Cultural Resource Information System (CRIS), an online archive of site files and survey reports that is viewable to qualified professionals. The review encompassed a Study Area extending in a 0.25-mi (0.4-km) radius from the proposed EW 2 onshore facilities. Tetra Tech reviewed CRIS for information relating to site location and type, temporal period, and NRHP status, in addition to information regarding prior archaeological surveys conducted within the Study Area. In January 2021, Tetra Tech updated the site file review to capture any resources that may have been added to the database since the original review in November 2018. The 2021 review identified no additional sites or archaeological surveys within the Study Area. Further reviews of CRIS data, historic cartography, and historic aerial imagery were undertaken throughout the third and fourth quarters of 2021, and in February 2022, as the project design envelope evolved.

K.2.2.6 Pedestrian Reconnaissance

On July 24, 2019, Tetra Tech archaeologists conducted a pedestrian reconnaissance of the onshore export and interconnection cable corridors. Tetra Tech archaeologists conducted a pedestrian reconnaissance of the proposed onshore substation on May 13, 2021. These reconnaissance visits were undertaken to evaluate the extent of prior ground disturbance within the PAPE, and to identify locales within the PAPE that might have the potential to contain undocumented archaeological resources.

K.3 Environmental and Cultural Setting

K.3.1 Environmental Setting

Long Island is situated at the northernmost extent of the Atlantic Coastal Plain physiographic province, a region of low relief and diverse ecological habitats. In general, the coarse-textured soils of the coastal plain are derived from Cretaceous period marine sediments and a mantle of Pleistocene period glacial till and outwash.

The principal features of the Long Island landscape are the east-west trending Harbor Hill and Ronkonkoma terminal moraines, the low relief outwash plain that descends from the moraines southward to the south-shore bays, and the barrier islands and salt marshes along the Atlantic shore. The moraines and outwash plain reflect Long Island's encounter with the arrival and retreat of the Laurentide ice sheet during the Wisconsin glacialiation. The moraines represent two phases of maximum glacial advance; the older Ronkonkoma moraine dates from 40,000 to 70,000 years before present (BP) and the younger Harbor Hill moraine to the last glacial maximum about 21,000 BP (Moss 2013; Sirkin 1995). Moraine sediments (till) are the product of rock debris transported and deposited by the leading edge of an ice sheet (Ritter 1978:394). The outwash plain generally consists of well-sorted sand and gravel deposited by meltwater streams flowing southward from the ice front. These outwash deposits have a maximum thickness of 600 ft (183 m). Older Pleistocene and Cretaceous sediments underlie the late-glacial outwash plain and jointly form Long Island's freshwater aquifers. Paleozoic metamorphic bedrock underlies the deepest Cretaceous deposits. This basement rock lies about 350 ft (107 m) below the ground surface in western Long Island, and dips steeply to the southeast; in north-central Long Island the bedrock is encountered at depths of 1,000 ft (305 m) (Needell et. al. 1987:2). Aside from small exposures of Fordham gneiss in Long Island City at the western extent of Queens County, Long Island is conspicuously bare of pre-Cretaceous bedrock outcrops (Fuller 1914:66).

The region's barrier islands resulted from the erosion and transport of unconsolidated sediments by waves and winds landward and by stream drainages moving seaward. Barrier islands are highly dynamic landforms that respond to onshore formations and processes (e.g., headland control, inlet drainage, and marsh fringes) and

offshore processes (e.g., tidal deltas, wave inundation and breaching, and sediment supply and circulation) (Ritter 1978:546). Barrier islands, such as Long Beach Island, are backed by open bays and mid-Holocene lagoonal deposits supporting *Spartina* salt marsh. Changes to barrier island morphology include accretion, erosion, and migration. Human activities contribute to this dynamic and include channel dredging and shoreline armoring. Dredging tends to reduce available sediment for island building. Shoreline bulkheads minimize local erosion, while groins and jetties will encourage accretion of beach sediment on their updrift side but result in beach erosion downdrift (Psuty et al. 2010).

Early colonial descriptions of Long Island's native flora are rare and tend to be brief. Of his voyage into New York Harbor, Henry Hudson described the landscape as "...full of great tall oaks...with grass and flowers and goodly trees..." (Munsell 1882:20). Writing in the 1670s, Daniel Denton described Long Island as "...very full of timber, as oaks white and red, walnut trees, chestnut trees...also red maples, cedars, sassafras, beech, holly, hazel with many more..." (quoted in Svenson 1936:208-209).

Presently, Long Beach Island and Barnum Island are densely developed residential and commercial communities with limited remnant environments of the kind prevalent prior to 1900.

K.3.2 The Archaeological Record in the Study Area

A review of CRIS identified no recorded terrestrial archaeological sites or previously conducted archaeological surveys within 1 mi (1.6 km) of the onshore facilities of the NY Project. Within the Study Area radius, two underwater anomalies of undetermined NRHP status are present in the Atlantic Ocean south of Long Beach Island. Within a 2-mi (3.2-km) radius of the NY Project, CRIS records a possible shipwreck location in the Atlantic Ocean of the *Mexico*, a nineteenth century sailing vessel. There are no recorded terrestrial archaeological sites along the 9.5-mi (15.3-km) length of the Long Beach barrier island nor on Barnum Island, the two land masses containing the bulk of the onshore export and interconnection cable routes. The nearest recorded terrestrial archaeological site to the NY Project is the Smith's Pond Pump Station-Feature 24 (05947.000004) that comprises facilities of a nineteenth century water-delivery system located about 3.1 mi (4.9 km) north of the proposed POI. The NRHP status of this site is undetermined. The Abraham Hewlett Historic Site (05901.003482) is located 3.5 mi (5.6 km) northwest of the NY Project and is represented by a low-density scatter of late nineteenth century and early twentieth century domestic refuse. CRIS records indicate NY SHPO has determined this site is not eligible to the NRHP.

The nearest recorded pre-contact period site to the NY Project is the Seaford Park Site (05901.000040), located along Cedar Creek in the Village of Seaford about 8.1 mi (13 km) northeast of the NY Project. The Seaford Park Site consisted of three large shell mounds on the margins of salt marsh adjacent to South Oyster Bay. A suite of radiocarbon dates from the mounds ranges from AD 530±50 to AD 670±60 (Cammisa 1995:33). The site is interpreted as specialized shellfish-processing stations associated with one or more base camps located on uplands along Cedar Creek, Seamans Creek, or another nearby stream.

K.3.3 Archaeological Sensitivity within the PAPE

Archaeological sensitivity is defined as the potential of a locale to contain previously undocumented archaeological resources, usually scaled as some increment between low and high. Sensitivity for precontact resources is based on an assessment of documented regional site patterns, results of previous archaeological surveys undertaken in the vicinity, and key environmental factors that may have influenced the selection of site locations. Assessments for historic period sensitivity would employ similar sources of evidence, in addition to reviews of historic maps, aerial imagery, photographs, and documents. The goal of sensitivity assessment is to identify areas within the NY Project PAPE with a high potential for possessing undocumented archaeological resources.

The onshore export and interconnection cable routes cross two types of landforms: the coastal barrier island and *spartina* salt marsh islands. Barrier islands evolve through dynamic and complex onshore and offshore processes involving wind, wave energy, sediment circulation, and storms that modify island morphology through erosion, accretion, and migration. Typically, *spartina* salt marshes fringe the landward side of barrier islands and occur in sheltered embayments where the forces of surf and storms are less severe. The barrier islands, *spartina* salt marsh, intertidal mudflats and open water embayments forming Hempstead Bay developed as post-glacial sea level rise moderated circa 4000 to 6000 years BP to create conditions for the establishment of stable estuarine habitats and the growth of shellfish communities (Bernstein 1993:47-50; Dent 1995:204; Donnelly 2000:77; Merwin 2010:24). There is evidence of long-term human adaptation to coastal environments in New York and southern New England, with a focus on the exploitation of shellfish (Bernstein 2006:277). Claasen (1996:104) noted intensive shellfish harvesting in the lower Hudson as early as 3500 BC. Shellfish may have become, for coastal groups, an important food source after circa 500 BC, indicated by the once-ubiquitous shell middens across the region (Bernstein 1993:5; Ritchie 1980:166).

Late nineteenth century maps depict extensive salt marshes throughout the NY Project vicinity (**Figure K-4** through **Figure K-6**). Estuarine environments of this sort would have contained rich sources of fish, shellfish, waterfowl, and aquatic mammals as well as plant resources, and may have been destinations for pre-contact task groups exploiting these items. Archaeological expressions of these task visits may include shell middens, lithic tool debris, and simple fire hearths. These historic maps also illustrate a narrow upland that rises above the marsh on Hog Island (**Figure K-4**), later known as Barnum Island (**Figure K-5** and **Figure K-6**). The Beers 1873 map (**Figure K-4**) depicts four structures on this upland and the U.S. Coast and Geodetic Survey map of 1895 (**Figure K-5**) shows the upland with the label “Poor House,” representing the Queens County poor farm built on Barnum Island in the 1870s. The northern portion of the proposed interconnection cable route will cross this topographic rise, along Long Beach Road/North Nassau Lane, and along Parente Lane North, in the Village of Island Park.

The barrier island (Long Beach Island) and marsh island (Barnum Island) were potential destinations for task groups during pre-contact and historic periods. Present archaeological sensitivity, however, is low. This assessment is based on long-term barrier island dynamics affecting Long Beach Island, and historic episodes of land-making and suburban development on Long Beach Island and Barnum Island.

Geodetic mapping of Long Island from 1835 to 1990 indicates a general east to west migration of its associated barrier islands following sediment transport routes of near-shore currents. Erosion at the east end of Long Beach Island has been as high as -23 ft (-7 m) per year, with accretion occurring at the western end (USACE 2015:11). The overall long-term rate of beach erosion for all Long Island barrier islands is -2 ft (-0.6 m) per year (Hapke et al. 2010:29). The processes that circulate and re-deposit barrier island sediments would result in significant disturbances to soil horizons containing potential archaeological deposits. Not surprisingly, CRIS contains no records of pre-contact sites on Long Island’s south shore barrier islands.

The land-making activities of the early twentieth century involved dredging canals through the marsh and using the dredge spoils to fill and expand the islands. Land-making doubled the size of the Long Beach barrier island and in the process covered the marsh under several feet of fill. Barnum Island was dredged and filled and its perimeter bulkheaded, eliminating all native marsh environs. By 1929, the Long Beach barrier island and all but the northernmost edge of Barnum Island had been transformed into made-land (**Figure K-7**). The northern edge of Barnum Island and the eastern shoreline of Hog Island Channel north of Barnum Island were filled in the early 1950s for the site of the E.F. Barrett Power Station and a tank farm (**Figure K-8**). By 1966, the *spartina* marsh in the vicinity of the E.F. Barrett Power Station had been filled as made-land (**Figure K-9**).

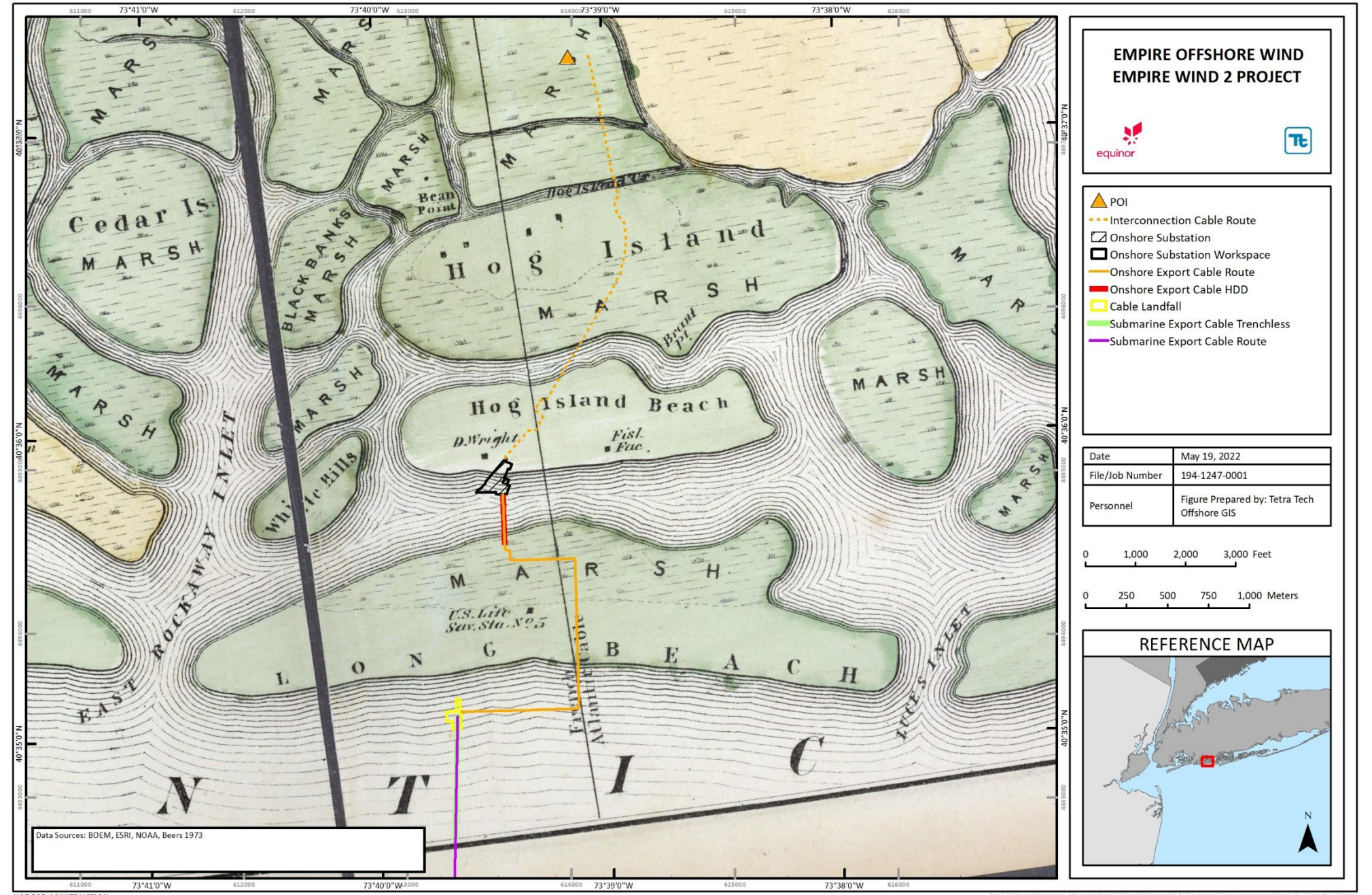


Figure K-4 1873 *Atlas of Long Island, South Part of Hempstead*, showing the Onshore NY Project Area

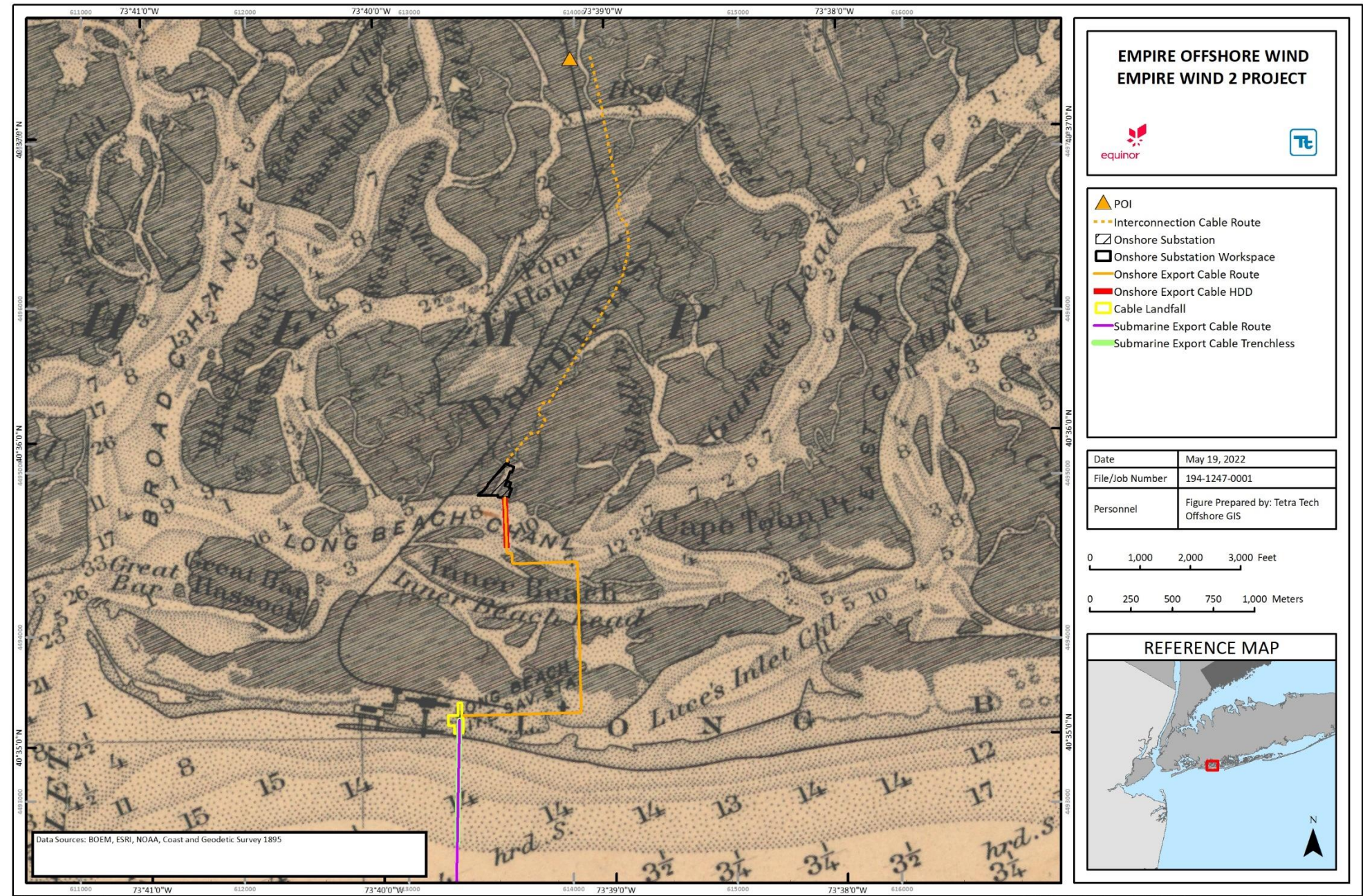


Figure K-5 1895 U.S. Coast and Geodetic Survey chart, *Fire Island Beach to Rockaway Beach, New York*, showing the Onshore NY Project Area

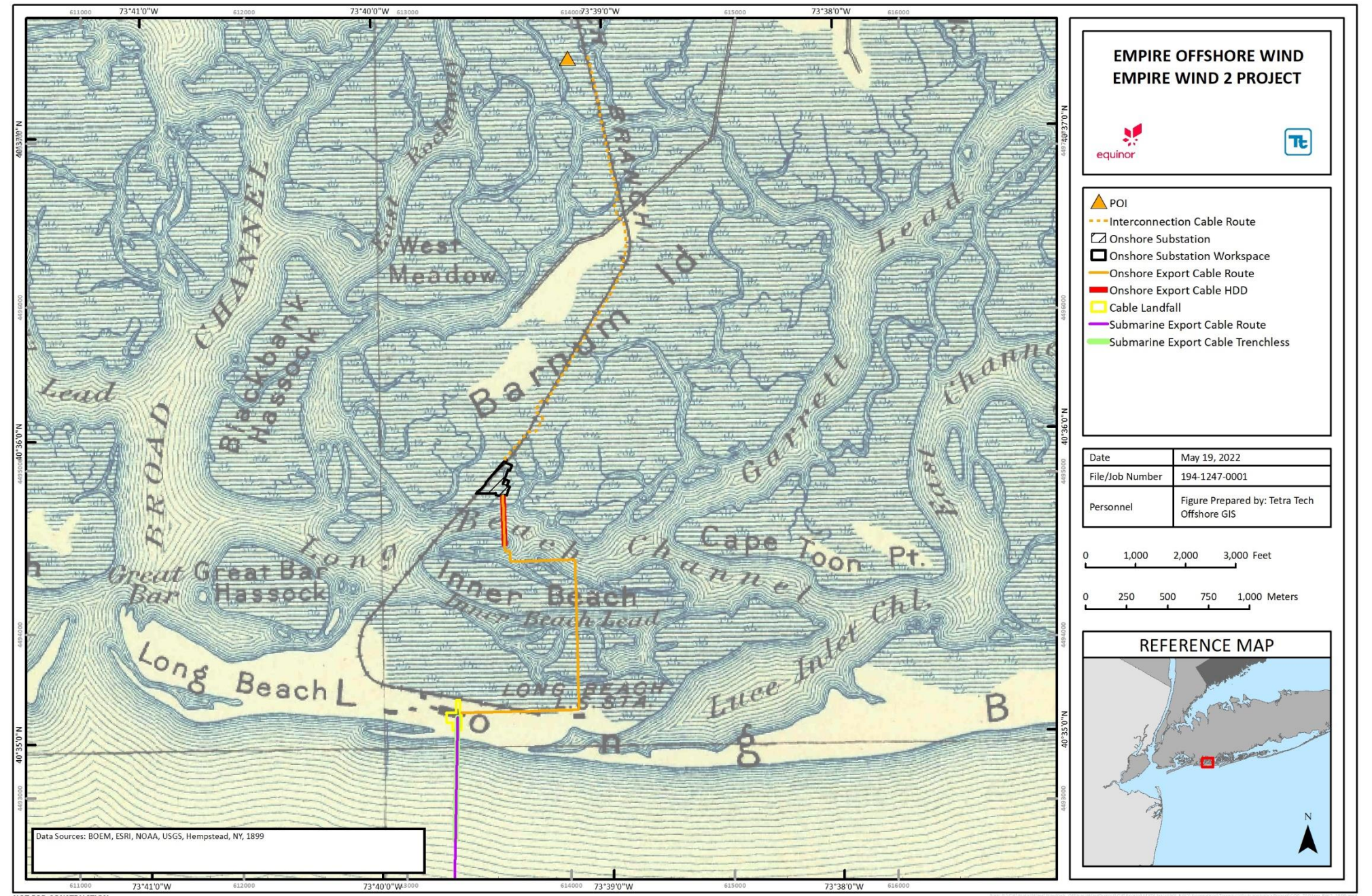


Figure K-6 1899 USGS Topographic Map, *Hempstead, NY*, Showing the Onshore NY Project Area

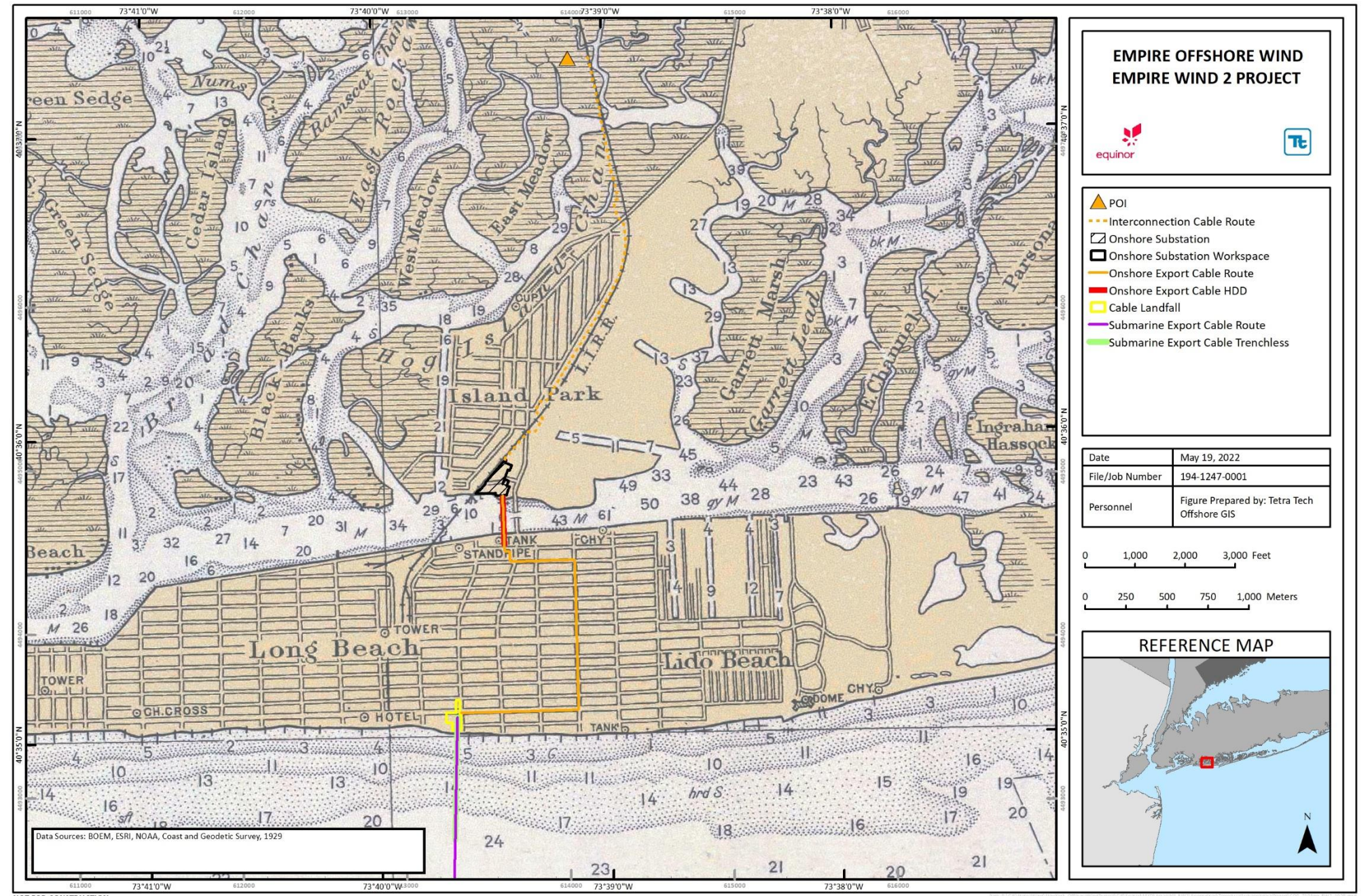


Figure K-7 1929 U.S. Coast and Geodetic Survey Chart, *Hempstead Bay*, Showing the Onshore NY Project Area



Figure K-8 1953 USGS aerial of Island Park, NY and environs, showing the Interconnection Cable Route

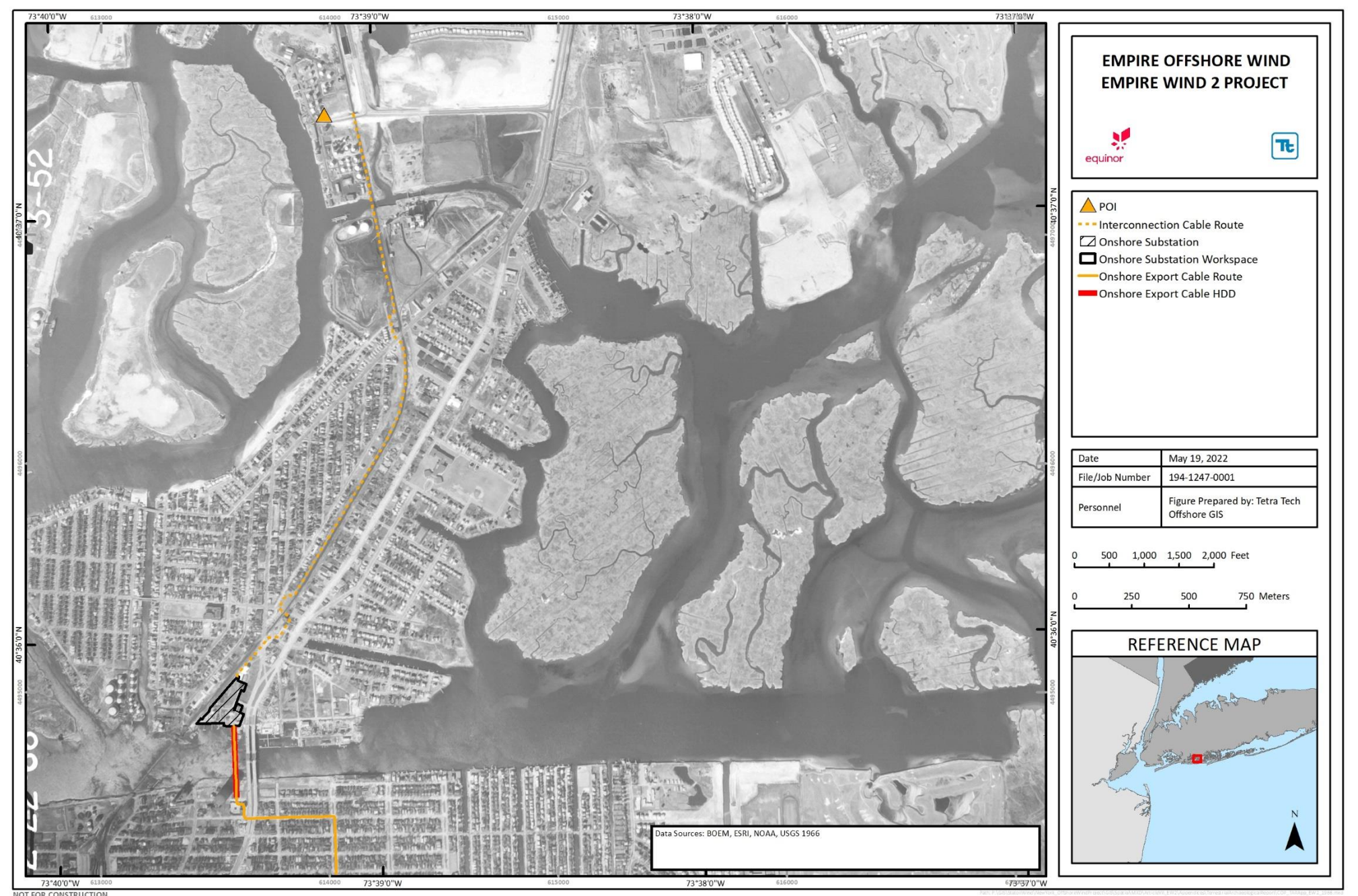


Figure K-9 1966 USGS aerial of Island Park, NY and environs, showing the Interconnection Cable Route

The locale of the proposed onshore substation is on the north shore of Reynolds Channel, situated between the Long Island Rail Road to the west and the Long Beach Bridge to the east. The shoreline at the proposed substation is bulkheaded. Late nineteenth century USGS geodetic and topographic sheets depicted this locale as marshland (**Figure K-5** and **Figure K-6**). Tetra Tech interprets the locale's proximity to the railroad and the bridge as evidence of likely ground disturbance from construction activities of fill layers created by the Barnum Island land-making episodes.

As noted above, the onshore export and interconnection cable corridors will be sited, to a large extent, within existing public road and LIRR rights-of-way including the LIRR Island Park Station parking lot (**Photo K-1** and **Photo K-2**). The installation of suburban infrastructure including roads and utilities, parking lots, the power station, and construction have introduced an additional tier of ground disturbances within the NY Project PAPE, including the onshore export cable routes, interconnection cable routes to the POI, and the onshore substation locale.

Tetra Tech concludes that the land-making dredge and fill activities, and road and utility construction, have resulted in significant ground disturbances to potential culture-bearing soil horizons within the NY Project PAPE. Available information regarding the precise nature of the dredge and fill operations of land-making (e.g., depth and lateral extent of fill) is sparse. Garrett Marsh lying east of Barnum Island across Shell Creek provides some perspective on the degree of fill on Barnum Island (**Figure K-7**). Garrett Marsh exhibits about 2 ft (0.6 m) of relief above mean sea level in contrast to the 5 to 8 ft (1.5 to 2.4 m) of relief on Barnum Island. The difference suggests that the layer of fill on Barnum Island measures somewhere between 3 and 6 ft (0.9 to 1.8 m) in thickness. A conversation with a local contractor with excavation experience on Barnum Island confirms this estimate.² If the pre-1900 upland on Barnum Island (**Figure K-4** through **Figure K-6**) had been, minimally, 3 ft (0.9 m) above the surrounding marsh (a lesser height is unlikely to have been noted on the U.S. Geology Survey and Coast and Geodetic Survey maps), then the fill covering the upland may have been very thin, if not completely absent. As noted above, the interconnection cable route and NY Project alternatives will cross the mapped upland along Long Beach Road from Kildare Road to North Nassau Lane, and along Parente Lane North, both in the Village of Island Park and unincorporated hamlet of Barnum Island, Town of Hempstead. Estimating that cable trench excavations will be approximately 3 to 10 ft (0.9 to 3 m) below grade, Tetra Tech concludes that the base of the trench has the potential to intrude into intact native soils in one or all of these three locales. As one of the few uplands mapped within the expansive marsh lagoon in Hempstead Bay, this landform possesses sensitivity for the presence of pre-contact and historic period archaeological resources, notwithstanding the high degree of infrastructure development and possible ground disturbances incurred during the past hundred years (**Figure K-10**).

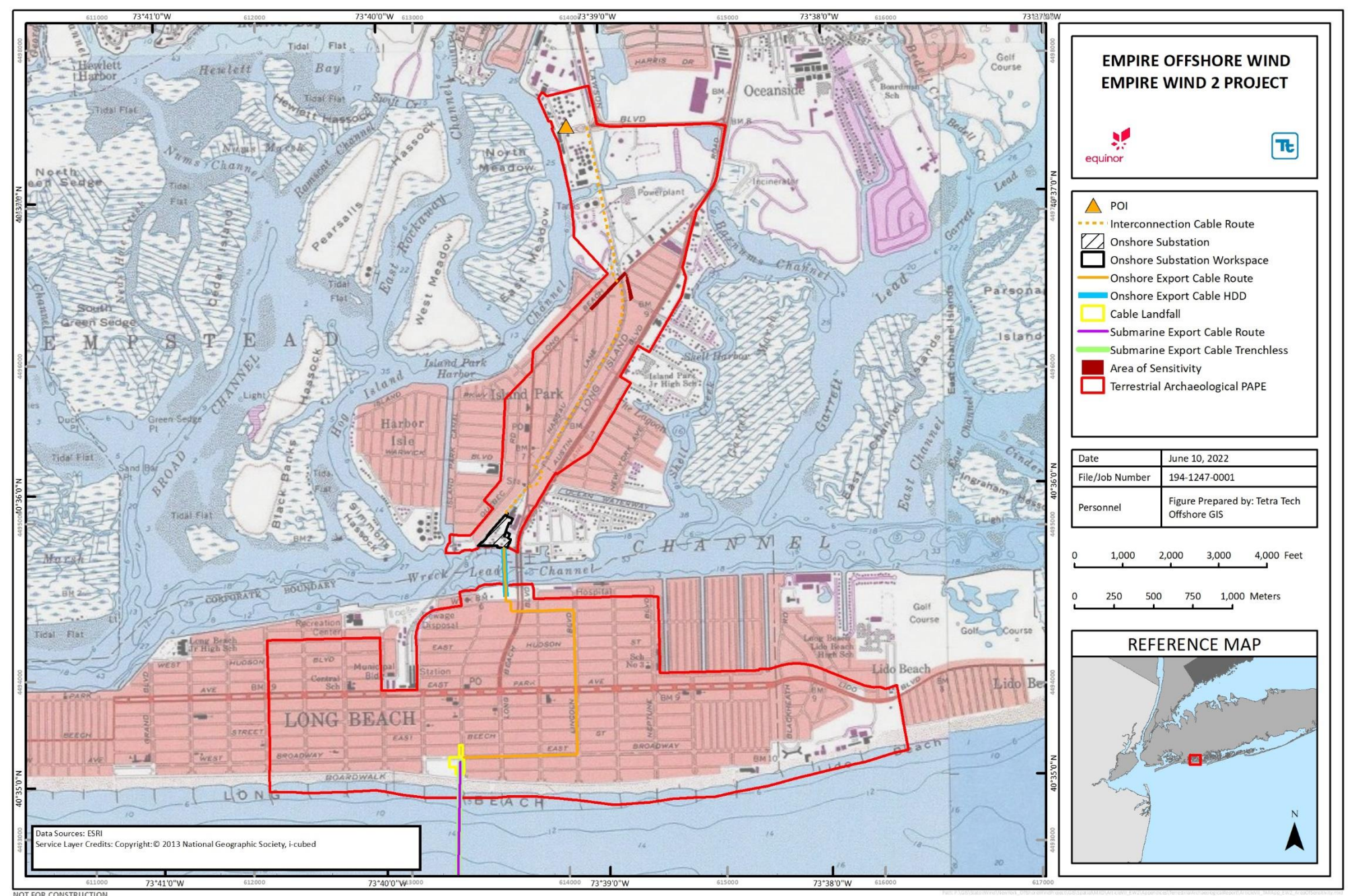
² Robert M. Jacoby personal communication with Bill Bitetto, B&B Contracting, September 13, 2019.



Photo K-1 Proposed Cable Landfall (Alternative A), Riverside Boulevard south of E. Broadway, City of Long Beach, NY. View to north. (Photographer: R. Jacoby, July 24, 2019)



Photo K-2 Interconnection cable route, LIRR Island Park Station. View to northeast. (Photographer: R. Jacoby, July 23, 2019)



K.4 Summary and Recommendations

Tetra Tech conducted a Phase I terrestrial archaeological survey of the proposed EW 2 onshore export and interconnection cable routes and onshore substation location in Nassau County, New York in 2019, in support of the NY Project. The survey was undertaken to comply with BOEM guidelines regarding the development of offshore wind generated power facilities, New York State guidelines, and to satisfy the requirements of federal permitting under Section 106 of the National Historic Preservation Act of 1966.

Onshore facilities of the NY Project include: (1) the cable landfall in the City of Long Beach; (2) onshore high-voltage alternating-current onshore export cables installed in subsurface trenches within public rights-of-way and private easements on surface roads, sidewalks, parking areas, and undeveloped parcels in the City of Long Beach and the Town of Hempstead; (3) a horizontal directional drill segment of the onshore export cable beneath Reynolds Channel; (4) an onshore substation to be built on commercial property adjacent to Railroad Place in the incorporated Village of Island Park, Town of Hempstead; and (5) an onshore interconnection cable to be installed in subsurface trenches connecting the onshore substation to the POI, with the exception of a cable bridge across Barnums Channel. The NY Project alternatives assessed include two additional cable landfall areas (Cable Landfall Alternatives C and E) and alternative export and interconnection cable routes. To assess the potential of the locations of these NY Project facilities to contain previously unrecorded archaeological resources, Tetra Tech conducted background research including a review of the online CRIS database maintained by NY SHPO and a literature review of pertinent information regarding local geology and soils, topography and hydrology, historical cartography and aerial imagery, and prehistoric and historic development in the NY Project vicinity.

Tetra Tech finds that no NRHP-listed, -eligible or potentially eligible archaeological resources are known within the Study Area evaluated during this Phase I Terrestrial Archaeological Survey. Further, because of the absence of recorded archaeological resources within the Study Area, NY Project actions are not anticipated to result in adverse indirect impacts. Tetra Tech concludes that the overall sensitivity of the direct effects PAPE evaluated in this Phase I is low due to (1) barrier island dynamics, (2) early twentieth century dredging and land-filling of marshland, (3) the construction of suburban developments on Long Beach Island and Barnum Island, (4) the cyclical episodes of infrastructure repair and replacement beneath surface roads where the onshore export and interconnection cables are to be installed, (5) industrial development in the vicinity of the POI, and (6) shoreline armoring and land-making at the onshore substation site.

Tetra Tech further concludes that, notwithstanding the high degree of suburban development on Barnum Island and resulting low overall sensitivity of the area, a short section of the NY Project PAPE exhibits moderate sensitivity for the presence of archaeological resources where the onshore interconnection cable corridor will cross the eastern edge of an upland depicted on late-nineteenth century maps. This upland was one of the few mapped uplands depicted in the Hempstead Bay region prior to the development of suburban communities on Long Beach Island and Barnum Island. As a topographic highpoint, the area may have attracted pre-contact hunter-gather groups for fishing and shellfishing tasks. During the 1870s the Queens County poor house was sited on the western spur of this upland (**Figure K-5**). Based on these conclusions, Tetra Tech recommends:

- Construction and operations of the NY Project be permitted within the areas surveyed; and
- As deemed necessary by the NY SHPO, an archaeological monitor be present during construction period excavation of the interconnection cable trench at the following areas of the interconnection cable route and route alternatives:

- An approximately 400-ft (122-m) section of the interconnection cable route along D’Amato Drive from the intersection of Parente Lane North northward to the intersection of D’Amato Drive and Long Beach Road in the unincorporated village of Barnum Island, Town of Hempstead, Nassau County, New York. Tetra Tech recommends monitoring undertaken from the intersection of D’Amato Drive and Parente Lane North (latitude 40.610821°N, longitude -73.648449°W) to the intersection of D’Amato Drive and Long Beach Road (latitude 40.611898°N, longitude -73.648621°W).
- An approximately 565-ft (170-m) section of the interconnection cable route along Parente Lane North, from the cul-de-sac to the intersection of Kildare Road in the unincorporated village of Barnum Island, Town of Hempstead, Nassau County, New York. Tetra Tech recommends monitoring undertaken from a point north of No. 19 Parente Lane North (latitude 40.609945°N, longitude -73.64856°W) northward along Parente Lane North to the intersection of Kildare Road and Parente Lane North (latitude 40.610855°N, longitude -73.649474°W).
- An approximately 110-ft (35-m) section of the interconnection cable route along Kildare Road from the intersection of Parente Lane North northward to the intersection of Long Beach Road in the unincorporated village of Barnum Island, Town of Hempstead, Nassau County, New York. Tetra Tech recommends monitoring undertaken from the intersection of Parente Lane North (latitude 40.610855°N, longitude -73.649474°W) to the intersection of Long Beach Road (latitude 40.611188°N, longitude -73.649505°W).
- An approximately 260-ft (80-m) section of the interconnection cable route along Long Beach Road from the intersection of Kildare Road northeastward to the intersection of Ladomus Road northward along Sherman Road to the intersection of Long Beach Road and Ladomus Avenue (latitude 40.612477°N, longitude -73.648015°W) in the unincorporated village of Barnum Island, Town of Hempstead, Nassau County, New York. Tetra Tech recommends monitoring undertaken from the intersection of Long Beach Road and Kildare Road (latitude 40.611188°N, longitude -73.649505°W) to the intersection of Long Beach Road and Ladomus Road (latitude 40.611762°N, longitude -73.649027°W).

The goal of archaeological monitoring is to identify any archaeological resources that potentially may be revealed during construction activities. If the archaeological monitor identifies archaeological resources during construction, each resource will be evaluated for its potential eligibility to the NRHP, and if determined NRHP eligible, Empire will choose an appropriate action, in consultation with NY SHPO, to avoid, minimize, or mitigate NY Project effects to that resource. With implementation of the above measures, no significant adverse impacts to archaeological resources would be expected to result from construction or operations of the proposed onshore facilities. If any substantial modifications are made to the NY Project design, consultation with NY SHPO and possibly additional archaeological survey may be necessary.

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